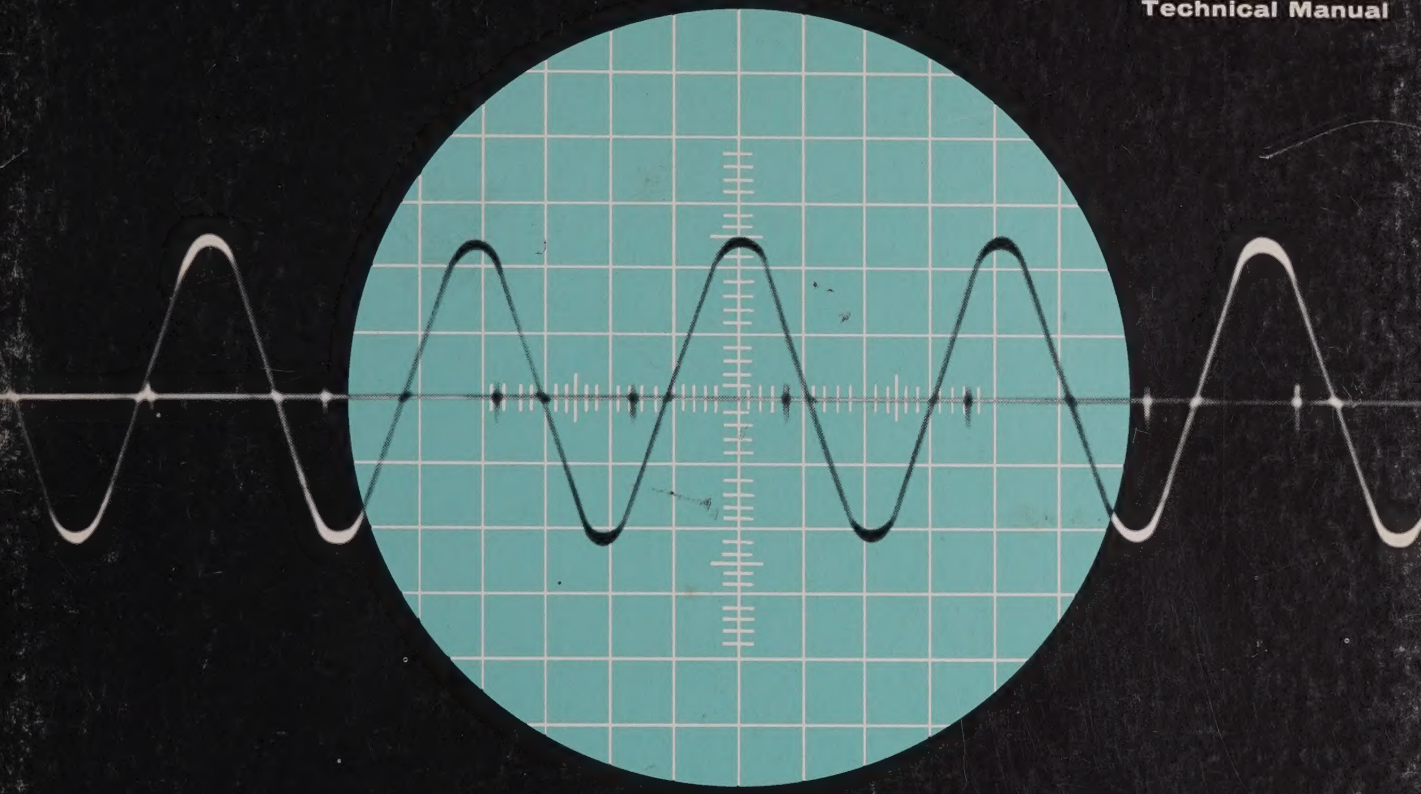
Technical Manual



ATRON SYSTEMS CORP.
1720 Newport Circle
Santa Ana, Calif. 92705

CRYSTAL-CONTROLLED
MARKER GENERATORS
Models CM-6 and CM-10

JERROLD
ELECTRONICS CORPORATION
GOVERNMENT AND INDUSTRIAL DIVISION
PHILADELPHIA, PENNA. 19105

JERROLD®

INSTRUCTION MANUAL 435-275.3

CRYSTAL CONTROLLED MARKER GENERATORS

MODELS CM-6 AND CM-10

BAYTRON SYSTEMS CORP.
1720 Newport Circle
Santa Ana, Calif. 92705

ELECTRONICS CORPORATION
GOVERNMENT & INDUSTRIAL DIVISION
PHILADELPHIA, PA. 19105

LKE, April 1966

All Data Subject to Change Without Notice

MARKER GENERATORS

Models CM-6, CM-10

INSTRUCTION MANUAL 435-275.3

Copyright © 1966 by the Jerrold Electronics Corporation, Philadelphia, Pa.

All rights reserved

Published by the Jerrold Electronics Corporation
Engineering Laboratory Publications Department.

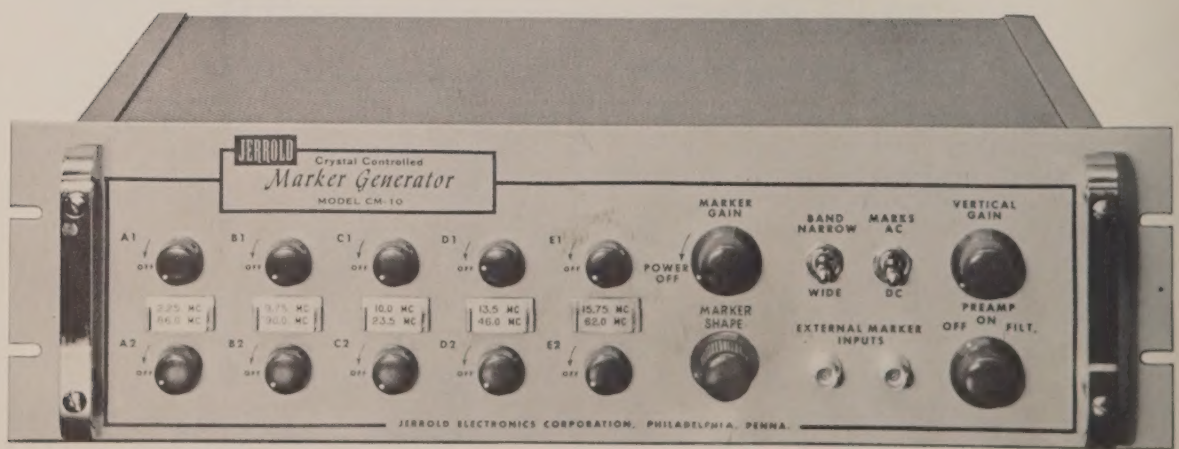
TABLE OF CONTENTS

	PAGE
General Description	1
Specifications	2
Chart of Controls	3
Circuit Description	4
Operation and Maintenance	5-8
Warranty	8
Parts List, CM-6	10-11
Parts List, CM-10	12-13
Parts List, Oscillators	14-15
Parts List, Plug-In Units	16

Crystal Controlled Marker Generators

MODEL CM-6

BAYTRON SYSTEMS CORP.
1720 Newport Circle
Santa Ana, Calif. 92705



MODEL CM-10

GENERAL DESCRIPTION

The Jerrold Marker Generator Models CM-6 and CM-10 are instruments for superimposing well-defined and precisely crystal-controlled a.c. or d.c. frequency marks in the range of 2 MHz to 100 MHz (Model CM-6) or 100 kHz to 100 MHz (Model CM-10) upon an oscilloscope display of frequency response curves from electronic devices under test.
Outstanding features:

1. Plug-in oscillator units with individual amplitude control for each oscillator.
2. "Birdie-bypass" circuitry.
3. CM-6: Display of up to 6 crystal-controlled frequencies, each with up to 20 harmonics.
   CM-10: Display of up to 10 crystal-controlled frequencies, each with up to 20 harmonics.
4. Choice of a.c. or d.c. marks.
5. Built-in scope preamplifier.

The portable Model CM-6 comes factory-equipped with three oscillator plug-in units, each unit having two crystal-controlled oscillator sections. The rack-mounted Model CM-10 has five such oscillator plug-in units. (See Figures 1 and 2 on opposite page.)

Additional plug-in units, or single crystals for individual oscillator sections, covering different frequencies, can be ordered and supplied to customer's specifications.
The instruments can thus be programmed to provide any desired fundamental frequencies between 2 MHz and 100 MHz in the case of Model CM-6, and between 100 kHz and 100 MHz in the case of Model CM-10.

The oscillator output amplitude can be individually controlled and varied from the front panel.

With the "birdie-bypass" method of marker insertion, the pips are not passed through the equipment under test. The marks therefore remain unaffected by the inherent characteristics of that equipment. Furthermore, marks superimposed on the response curves can have either a.c. character, extending both above and below the curve, or d.c. character, extending only above the response curve. In addition, Model CM-10 has a MARKER SHAPE control allowing to vary the bandwidth of the marker pips, both within the wide-band and narrow-band ranges.

The instruments have a built-in oscilloscope preamplifier and a high-pass filter. This feature assures clear visibility on the scope of low-amplitude sweep voltages, for which otherwise an external scope preamplifier would be required.

The versatility of both Models is further enhanced by the provision on the front panels for connecting two external marker generators. For these too, "birdie-bypass" circuitry is provided.

Models CM-6 and CM-10 are housed in well-ventilated, sturdy cabinets. Model CM-6 is portable and very convenient for field and bench use. Model CM-10 is designed for rack-mounting, with four screws provided for mounting on standard rack constructions. Two handles on the front panel enable easy pullout.

BAYTRON SYSTEMS CORP.
1720 Newport Circle
Santa Ana, Calif. 92705

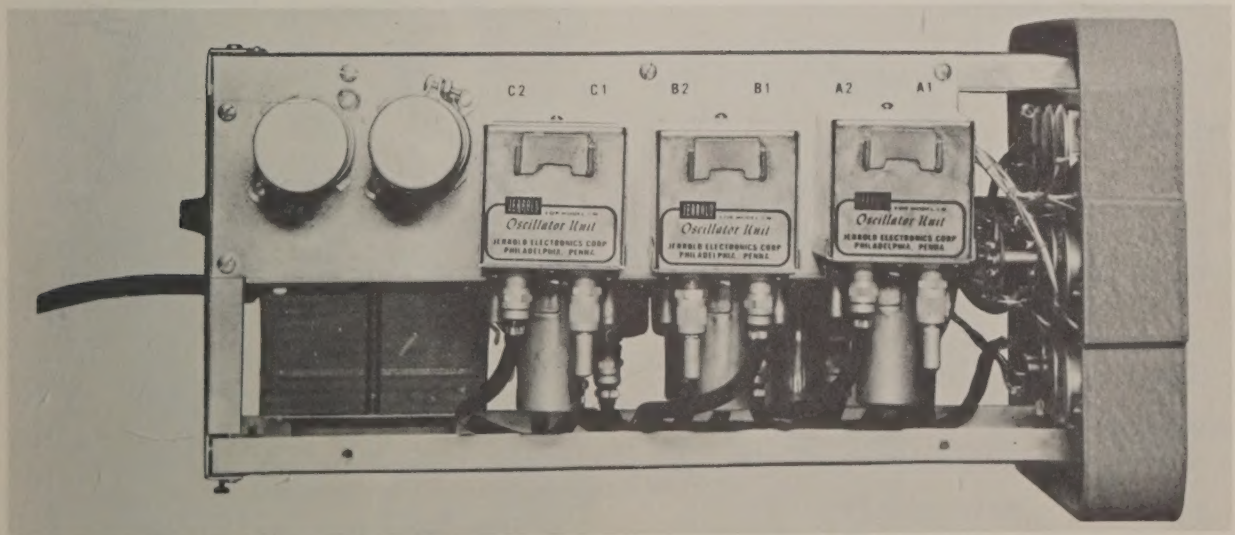


Figure 1—Jerrold Crystal-Controlled Marker Generator—Model CM-6
Top view of Chassis showing oscillator plug-in units.

SPECIFICATIONS

OVERALL FREQUENCY RANGE

CM-6: 2 MHz to 100 MHz

CM-10: 100 kHz to 100 MHz

OSCILLATOR FREQUENCY RANGES

High-High, Both Models: Any frequency within the range of 20 MHz to 100 MHz, each oscillator section.

Low-High, CM-6: Any frequency within the range of 2 MHz to 20 MHz + any frequency within the range of 20 MHz to 100 MHz.

CM-10: Any frequency within the range of 100 kHz to 20 MHz + any frequency within the range of 20 MHz to 100 MHz.

Low-Low, CM-6: Any frequency within the range of 2 MHz to 20 MHz, each oscillator section.

CM-10: Any frequency within the range of 100 kHz to 20 MHz, each oscillator section.

MARKS

CM-6: Display of up to 6 crystal-controlled frequencies, each with up to 20 harmonics;

CM-10: Display of up to 10 crystal-controlled frequencies, each with up to 20 harmonics;

Wideband marks peak approx. 30 kHz above and below zero beat;

Narrowband marks peak approx. 10 kHz above and below zero beat;

(Model CM-10 allows for variation in marker bandwidth within wide-band and narrow-band ranges)

a.c. marks for oscilloscopes;

d.c. marks for X-Y plotters;

Additional inputs for up to two external marker generators.

PREAMPLIFIER

GAIN:	40 dB, minimum
MAX. UNDISTORTED OUTPUT:	5 volts (into 100 k-ohms or higher)
FLATNESS: CM-6:	±2 dB from 20 Hz to 20 kHz
CM-10:	±2 dB from 20 Hz to 50 kHz
HUM AND NOISE: (Referred to input)	Input short-circuited: 10 uV, p-p Input open-circuit: 500 uV, p-p

POWER SUPPLY

INPUT:	115/230 VAC, 60/50 Hz
OUTPUT:	Plate voltages, CM-6: 215 V, 150 V CM-10: 260 V, 150 V Filament voltages, CM-6: 6.3 VAC, 12.6 VDC CM-10: 6.3 VAC, 12.6 VDC
RECTIFICATION:	Silicon diodes, full-wave rectifier, for plate voltages Silicon diode, half-wave rectifier, for filament voltages of Marker Amplifier and Preamplifier
STABILIZATION:	Plate voltage fluctuations compensated for by OA2 stabilizer tube
CONSUMPTION:	CM-6: 60 W; CM-10: 80 W

TUBE COMPLEMENT

CM-6: (1) OA2, (1) 12AY7, (1) 12AT7

CM-10: (1) OA2, (2) 12AY7, (1) 6CB6

OSCILLATOR PLUG-IN UNITS: (1) 12AT7, each

DIMENSIONS

CM-6: 15" x 11" x 7½"

CM-10: 19" x 14" x 5"

NET WEIGHT

CM-6: 21 lbs. CM-10: 24 lbs.

SHIPPING WEIGHT

CM-6: 31 lbs. CM-10: 34 lbs.

Figure 2—Jerrold Crystal-Controlled Marker Generator—Model CM-6 Front Panel View

Figure 6—Jerrold Marker Generators—Models CM-6 and CM-10, Controls Chart

CHART OF CONTROLS

(Compare Figures 3, 4, 5)

DESIGNATION	POSITION	FUNCTION
	OFF	Oscillators cut off
A-1, A-2, B-1, B-2, C-1, C-2, D-1, D-2, E-1, E-2, (CM-10)	Clockwise turn	Oscillator amplitudes are increased
	Counter-clockwise turn	Oscillator amplitudes are decreased
A-1, A-2, B-1, B-2, C-1, C-2, (CM-6)		
MARKET GAIN	POWER OFF	Power switch incorporated in control disconnects set from power source
	Clockwise turn	Power on; output levels of all oscillator signals previously selected by A-1, A-2, etc. are increased
	Counter-clockwise turn	Output levels of all oscillator signals are decreased
MARKER SHAPE (CM-10 only)	Clockwise and Counter-clockwise	Increases and decreases bandwidth of markers within range selected by NARROW-WIDEBAND switch
PREAMP	OFF	Input signal from sweep generator is not amplified
	ON	Input signal from sweep generator is amplified
	FILT	High-pass filter is inserted into preamplifier network
VERTICAL GAIN	(This control is continuously functional independent of PREAMP control position) clockwise and counter-clockwise	Varies the vertical gain of the signal output
AC DC MARKS	AC	Selects markers with a.c. characteristics
	DC	Selects markers with d.c. characteristics
NARROW-WIDEBAND	NARROW	Selects markers with 10 kHz bandwidth
	WIDE-BAND	Selects markers with 30 kHz bandwidth

BAYTRON SYSTEMS CORP.
1720 Newport Circle
Santa Ana, Calif. 92705

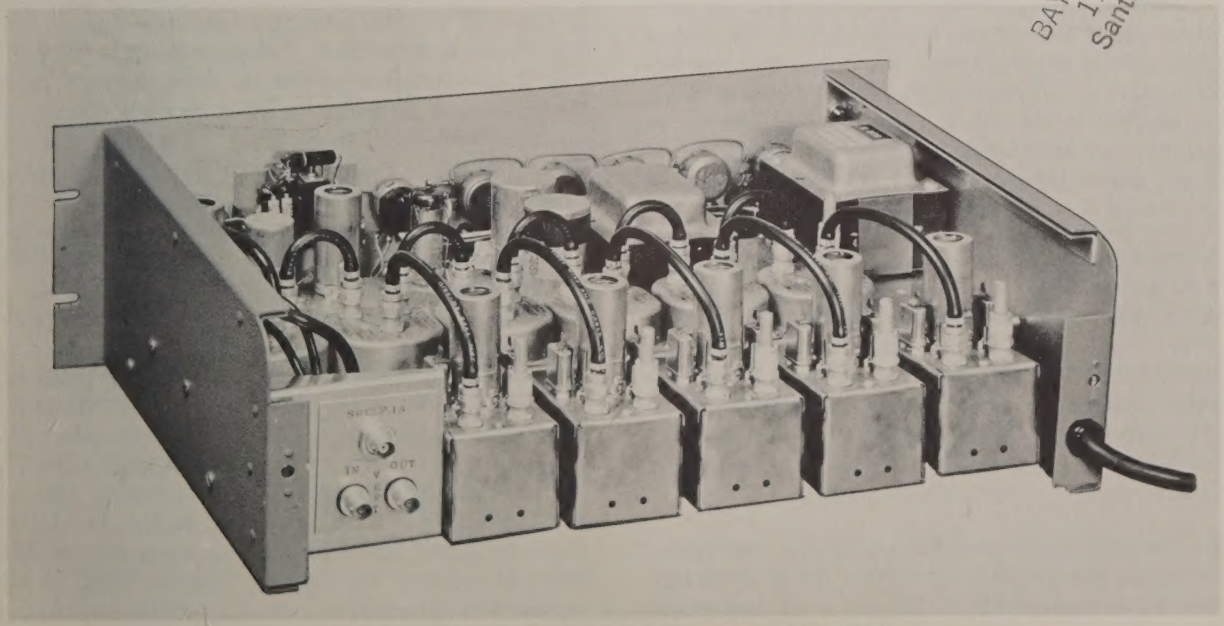


Figure 3—Jerrold Crystal-Controlled Marker Generator—Model CM-10
Rear View of Chassis

CIRCUIT DESCRIPTION

(Refer to schematic circuit diagrams, Figures 13 through 17.)

1. POWER SUPPLY

Both models, CM-6 and CM-10 can be energized either from a 115 V 60 Hz or a 230 V, 50 Hz a.c. source. Silicon diodes provide full-wave rectification for well filtered plate voltages with voltage fluctuations compensated for by a stabilizer tube. In addition, separately rectified filament voltages are supplied for the marker amplifier and preamplifier stages to minimize hum. A 750 mA SLO-BLO fuse protects the instruments against surge currents.

NOTE: If the instruments are to be energized from a 230 VAC source, the fuse has to be replaced by a 500 mA type.

2. OSCILLATORS

a. GENERAL. The shielded plug-in oscillator units have two crystal-controlled oscillator sections each.

Model CM-6, equipped to meet standard requirements, has three plug-in units: two containing two high-frequency oscillator sections each, the third unit containing one high-frequency and one low-frequency oscillator section.

Model CM-10 has 5 plug-in units, each unit having one high-frequency and one low-frequency oscillator section.

b. OSCILLATOR CIRCUITS. The high-frequency oscillator circuit covers the range from 20 MHz to 100 MHz. A 12AT7 twin-triode is employed in a grounded plate "Hartley" circuit. The crystals operate in a series mode from the cathodes to taps on coils L-1 and L-2. The coils are tuned to their respective crystal frequencies or slightly above, according to the number of harmonics desired. Trimmers C-8 and C-9 couple the oscillator energy to connectors J-1 and J-2 and thence via shielded cable to the mixer. All oscillator plug-in units have terminating resistors (TR-72F) mounted on J-2. If it is desired to use one oscillator in one unit as a side-band generator for an oscillator in a second unit, the terminating resistor in the second unit has to be removed and J-1 on the first unit to be jumpered to J-2 on the second unit.

The low frequency oscillator unit covers a range from 2 MHz to 20 MHz for Model CM-6, and a range from 100 kHz to 20 MHz for Model CM-10. This circuit is a modified grounded-plate "Pierce" type. Here the crystals operate in parallel mode from grid to cathode. L-1 and L-2 again are tuned to their respective crystal frequencies or slightly above, according to the number of harmonics desired. Capacitors C-4 and C-7 couple the oscillator energy through connectors J-1 and J-2 via shielded cable to the mixer.

The low-high frequency oscillator unit has one low-frequency section and one high-frequency section. The circuit arrangement is a combination of the circuits used in the low-frequency and high-frequency oscillators described above. Here, one half of the twin-triode operates in the modified "Pierce," the other half in the modified "Hartley" circuit.

For Model CM-6 this plug-in unit covers the range of 2 MHz to 20 MHz and from 20 MHz to 100 MHz.

For Model CM-10 the ranges are from 100 kHz to 20 MHz and from 20 MHz to 100 MHz.

3. MIXER STAGE

All mixers, including that for the external marker generators, are identical in design. The oscillator energies enter through the relevant J connectors and are coupled through capacitors to their respective crystal diodes. A sample of the sweep output voltage, entering at SWEEP IN, passes through all mixers. A portion of this output is fed through voltage dividers to the diodes. The dividers also prevent the oscillator voltages in the mixer from affecting the sweep output voltage of the equipment under test, and the mixers from affecting each other through unwanted beat frequencies.

The difference frequencies obtained from the mixer stage are filtered through rc blocks and fed to the marker amplifier stage.

4. MARKER AMPLIFIER

In the marker amplifier stage the signals from the mixers are combined on the grid of one section of a 12AY7 twin triode (12AT7 in Model CM-6). There they are amplified, with their 10 kHz or 30 kHz component determined by a choke in the plate circuit. In Model CM-10 a potentiometer (R-51, MARKER SHAPE), connected in series with the choke, permits to vary the bandwidth of the marker pip within the range selected by the NARROW-WIDEBAND switch (SW-2). The MARKER GAIN potentiometer (R-32 in Model CM-6, R-52 in Model CM-10) controls the grid voltage of the second 12AY7 triode, permitting to vary the size of the marker pip. In Model CM-6 the amplified signal from the plate of the second triode is fed via the NARROW-WIDEBAND switch directly to the primary of transformer T-2. In Model CM-10 the signal voltage is further amplified in a 6CB6 pentode, from where it is passed to T-2. This transformer is self-resonant at 30 kHz and is tuned to 10 kHz by switching an RC block into the circuit through the NARROW-WIDEBAND switch SW-2. The secondary of T-2, connected in series with the signal voltage, injects the markers via the VERTICAL OUT connector upon the trace. With AC-DC MARKS switch (SW-3 in Model CM-6, SW-4 in Model CM-10) in DC position, two diodes rectify the marker signal and a positive pip is produced (its amplitude extending only above the response curve). In AC position, the signal character is left undisturbed and the marker pip amplitude extends above and below the response curve.

5. PREAMPLIFIER

The preamplifier has a minimum gain of 40 dB. It employs a low-noise 12AY7 twin triode in a d.c.-coupled circuit with stabilized feedback. The response of the amplifier is flat ±2 dB from 20 Hz up to 20 kHz for Model CM-6, and up to 50 kHz for Model CM-10. Maximum undistorted output is 5 volts, into 100,000 ohms or higher.

A high-pass filter network switched into the preamplifier circuit with PREAMP switch in FILT position, insures that h.f. response is not affected when the unit is used with delay line patterns. Low amplitude sweep voltages are clearly visible on the trace and no external oscilloscope preamplifier is necessary.

OPERATION AND MAINTENANCE

1. CONNECTING THE MARKER GENERATOR

The Jerrold Marker Generator Models CM-6 and CM-10 can be used with any conventional sweep frequency generator (Jerrold Models 900 Series, or equivalent) and a laboratory oscilloscope. Fig. 7 shows the general hook-up of the marker generator. The chart of controls should be carefully studied to become acquainted with the various control functions, before starting to operate the equipment.

Apart from the controls listed there, three main connections are provided. On Model CM-6 they are mounted on the front panel, on Model CM-10 at the rear of the chassis (compare Fig. 3 and Fig. 5).

1. VERTICAL IN for connection to the vertical output of the sweep frequency generator.
2. VERTICAL OUT for coupling to vertical input of the oscilloscope.
3. SWEEP IN for connection to a T connector (JERROLD MODEL TO-20 or equivalent), the other two legs of which are connected respectively to the r-f output of the sweep frequency generator and to the electronic gear under test.

NOTE: Shields of interconnecting cables must be well grounded!

Two further connectors EXTERNAL MARKET INPUTS are provided on the front panels of both Models CM-6 and CM-10, for conecting one or two external marker generators whenever required.

*Request Tech Data Sheets from Jerrold Electronics Corporation, G. & I. Division, 401 Walnut Street, Phila., Pa. 19105. Wire, phone or call.

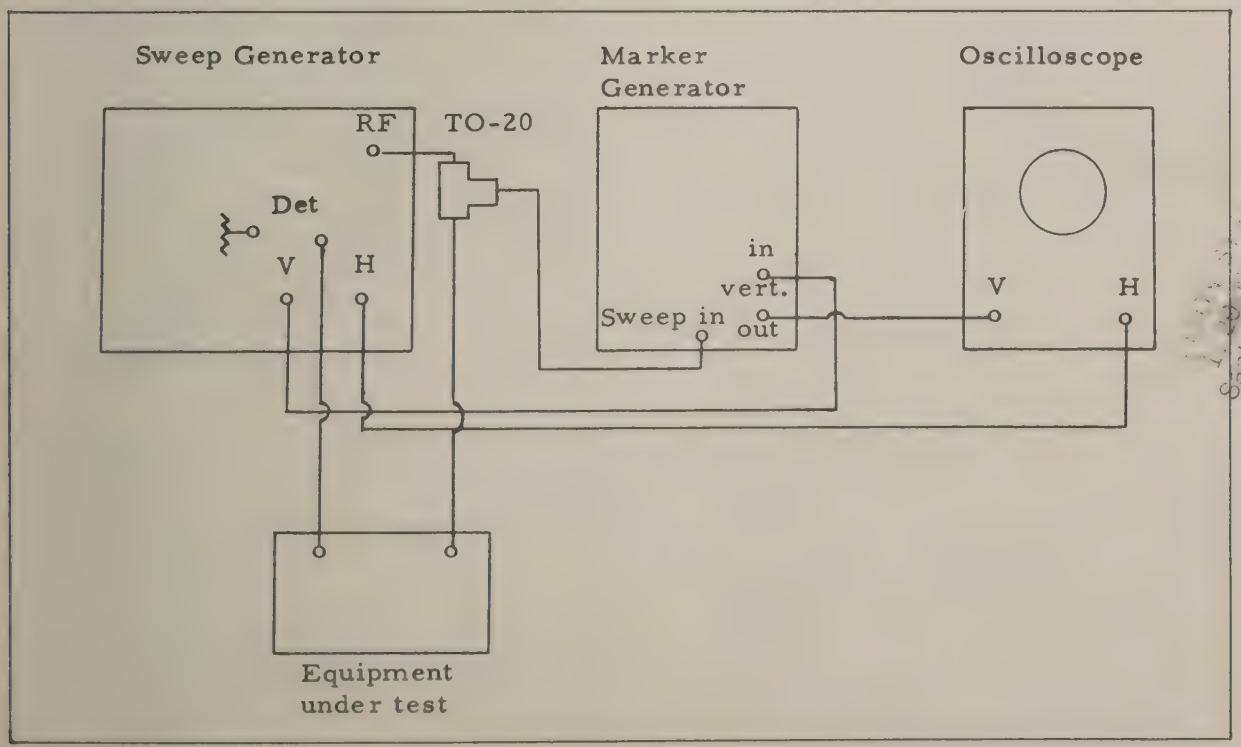


Figure 4—General Hook-Up of Marker Generator

Santa Ana, Calif. 92705

Fig. 5 shows typical scope presentations of frequency response curves having large bandwidth and with well-defined marker pips superimposed at pertinent points across the curves.

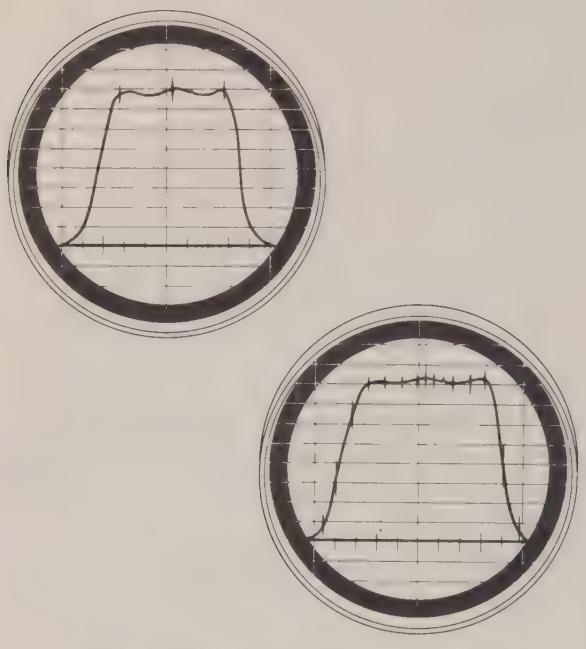


Figure 5—Typical Response Curves with Marker Pips

2. CHECK-OUT OF THE MARKER GENERATOR

For proper check-out of the instruments, voltage and resistance measurements charts (Figs. 9 thru 12) are given for both Models CM-6 and CM-10. The charts should be used in conjunction with the relevant schematic circuit diagrams. Slight variations in tube characteristics may vary voltage readings to a minor degree.

TUBE	MARKER GENERATOR			OSCILLATOR
PIN #	V-1	V-2	V-3	V-1
1	150 V	225 V	115 V	0-185 V*
2		0	0	—0.4 V
3		4 V	100 V	0
4		12 V (DC)	12 V (DC)	6.3 V (AC)
5	150 V	0	0	6.3 V (AC)
6		225 V	115 V	0-185 V*
7	0	0	115 V	—0.4 V
8		4 V	115 V	0
9				0

*Voltage measurements vary with operation of individual oscillator amplitude control, all others at zero output position.
NOTE: All measurements were made with a 20,000 ohms per volt instrument and with all controls set at maximum counterclockwise position.

Figure 9—Jerrold Crystal-Controlled Marker Generator Model CM-6 Voltage Measurements Chart

TUBE	MARKER GENERATOR			OSCILLATOR
PIN #	V-1	V-2	V-3	V-1
1	20 K*	15 K*	125 K*	10 K
2		95 K	inf.	100 K
3		1 K	inf.	0
4		5	5	0
5	20 K*	0	0	0
6		15 K*	50 K*	10 K
7	0	2	125 K*	100 K
8		1 K	100 K*	0
9				0

*Measurements will vary with capacitor charge.
NOTE: All measurements were made with a 20,000 ohms per volt instrument and with all controls set at maximum counterclockwise position.

Figure 10—Jerrold Crystal-Controlled Marker Generator Model CM-6 Resistance Measurements Chart

	MARKER GENERATOR								OSCILLATOR			
TUBE	0A-2		6CB6		12AY7		12AY7		12AT7			
PIN	V-1		V-2		V-3		V-4		V-1A (Lo)		V-1B (Hi)	
#	A	B	A	B	A	B	A	B	A	B	A	B
1	150 dc	150 dc	0	0	115 dc	110 dc	115 dc	60 dc	X	X	0	195 dc
2			2.0 dc	1.8 dc	—.14 dc	—.14 dc	0	0	X	X	—.37 dc	—.37 dc
3			6.3 ac	6.3 ac	Gnd.	Gnd.	105 dc	—.42 dc	X	X	0	0
4			Gnd.	Gnd.	12.6 dc	12.6 dc	12.6 dc	12.6 dc	6.3 ac	6.3 ac	6.3 ac	6.3 ac
5	150 dc	150 dc	260 dc	230 dc	Gnd.	Gnd.	Gnd.	Gnd.	6.3 ac	6.3 ac	6.3 ac	6.3 ac
6			135 dc	120 dc	140 dc	125 dc	115 dc	125 dc	0	210 dc	X	X
7	Gnd.	Gnd.	Gnd.	Gnd.	0	0	115 dc	60 dc	—.30 dc	—.30 dc	X	X
8					1.4 dc	1.3 dc	115 dc	60 dc	0	0	X	X
9					6.3 dc	6.3 dc	6.3 dc	6.3 dc	Gnd.	Gnd.	Gnd.	Gnd.

NOTES: 1. All measurements to ground.
2. All ac measurements made with moving vane dynamometer type instrument.
3. All dc measurements made with 20,000 ohms/volt type instrument.
4. Measurements under A made with all controls at minimum position.
5. Measurements under B made with all controls at maximum position.

Figure 11—Jerrold Crystal-Controlled Marker Generator Model CM-10, Voltage Measurements Chart.

TUBE	MARKER GENERATOR				OSCILLATOR	
PIN	0A2	6CB6	12AY7	12AY7	12AT7	
#	V-1	V-2	V-3	V-4	V-1A	V-1B
1	Charge 20 K to 40 K	100 K	40 K	120 K	X	20 K
2		220 Ω	100 K	3 M	X	100 K
3		0.1 Ω	0	560 Ω	X	0.4 Ω
4		0	6 Ω	6 Ω	0.1 Ω	0.1 Ω
5	Charge 20 K to 40 K	22 K	0	0	0.1 Ω	0.1 Ω
6		80 K	60 K	60 K	20 K	X
7	0	0	100 K	120 K	100 K	X
8			560 K	85 K	0.1	X
9			4.5	4.5	0	0

NOTES: 1. All measurements to ground.
2. All controls at maximum position.
3. Oscillator unit plugged in.
4. Switch PREAMP in ON position.

Figure 12—Jerrold Crystal-Controlled Marker Generator Model CM-10, Resistance Measurements Chart

3. FIELD MAINTENANCE

Under normal usage and with proper application, Jerrold Marker Generator Models CM-6 and CM-10 give accurate, trouble-free, long-life service.

Replacement parts lists for both models are included in this manual. When ordering any component, the model number, serial number, and the Jerrold part number should be quoted. When replacing a tube, only a new exactly equivalent type of a recognized brand should be substituted.

When replacing rectifier diodes or crystals, proper polarity must be observed.

In case the instrument does not function properly Jerrold's Instrument Service Department should be notified immediately. Give the set's serial number and describe accurately the difficulties encountered. Information will promptly be forwarded, how to correct the instrument, or authorization will be given to return the instrument to the factory.

In case the set is being returned to the factory, it must bear its identification tag. Pack carefully and ship prepaid via express.

See our warranty on page 8.

4. ALIGNMENT

a. GENERAL. As explained in the circuit description, the low frequency oscillators and the high frequency oscillators have different basic circuitry.

Alignment procedure will therefore differ too; however, any oscillator section may be adjusted for maximum performance and can be aligned to have either rich harmonic content or low harmonic content.

The instruments required for alignment are a high quality sweep generator (such as Jerrold Models 900-A or 900-B) and a high quality oscilloscope. In the alignment procedure given here, the set-up presupposes the use of a Jerrold Model 900-A Sweep Generator. When using a different instrument, the control functions will be the same, though the control designations may differ for different models.

b. EQUIPMENT SET-UP

(1) Set the sweep generator to VHF range of 0-400 MHz; blanking ON; automatic gain control ON; set marker generator MARKER GAIN control at maximum counter-clockwise position.

(2) Set oscilloscope vertical sensitivity to 30 mV/cm.

(3) Set all oscillator amplitude controls (A-1, A-2, B-1, B-2, etc.) on marker generator at OFF (maximum counter-clockwise).

(4) Set NARROW-WIDEBAND switch on marker generator at WIDEBAND.

(5) Set AC-DC MARKS switch on marker generator at AC.

(6) Set PREAMP control on marker generator at OFF.

(7) Set VERTICAL GAIN control on marker generator so that a 4 cm deflection appears on the scope.

(8) Now turn MARKET GAIN control on marker generator just below noise level.

NOTE: Allow at least ½ hour for proper warm-up of equipment before proceeding with alignment.

c. ALIGNMENT PROCEDURE

(1) Low-frequency oscillator with many harmonics:

(a) Turn L-1 to maximum counter-clockwise position, C-6 to mid-range.

(b) Turn L-1 clockwise until maximum number of harmonics appear.

(c) Turn oscillator amplitude control from OFF position slowly in clockwise direction until oscillations start. Highest pip to show on the scope should indicate fundamental frequency. If second harmonic is highest, L-1 is turned in too far; adjust as necessary.

(2) Low-frequency oscillator with few harmonics:

(a) Turn C-6 to minimum coupling position.

(b) Turn L-1 clockwise until oscillations cease, then counter-clockwise until oscillations start. This will give point with minimum number of harmonics.

(3) High-frequency oscillator with many harmonics:

(a) Turn L-2 and L-4 to maximum clockwise position with C-9 at about midrange.

(b) Turn oscillator amplitude control to maximum clockwise position.

(c) Turn L-2 slowly clockwise until oscillator drops out, then back up slowly until oscillator drops in.

(d) Turn L-4 clockwise until circuit goes into self-oscillation; this becomes apparent by pip walking while L-2 is being tuned.

(e) Back off L-4 until L-2 can be tuned through entire range without the pip walking.

(f) Switch sweep generator to UHF and turn VERTICAL GAIN control on marker generator to display pattern on CRT screen.

(g) Turn L-2 counter-clockwise and vary C-9 until pips are maximum size.

(h) Return sweep generator to VHF, turn oscillator amplitude control to OFF.

(i) Turn oscillator amplitude control slowly clockwise until oscillations set in. (Oscillations should start with about 25% rotation of control.) Largest pip should indicate fundamental frequency.

(4) High-frequency oscillators with few harmonics:

(a) Set up oscillator as in (3) above.

(b) Reduce coupling of C-9 to minimum.

(c) Set oscillator amplitude control at approx. 50% rotation and turn L-4 counter-clockwise until oscillations cease; then return until oscillations start again.

(d) Turn L-2 clockwise until oscillations cease, then counter-clockwise until oscillations start again. This is point of minimum number of harmonics.

1. The Manufacturer warrants this test equipment, including all its component parts (except tubes, semi-conductors and relays), to be free from defects in material and workmanship under normal use and service, its obligations being limited to making good at its factory any part or parts so warranted which shall within one year after delivery by the Manufacturer be returned to it with transportation charges prepaid and which its examination shall disclose to its satisfaction to have been thus defective.

2. The benefit of this warranty shall not apply to any instrument or part thereof which shall have been repaired or altered outside of a repair unit, authorized or approved by the Manufacturer, in any way so as in the judgment of the Manufacturer to affect its stability and reliability, nor which has been subject to misuse, neglect, accident or improper application.

3. The Manufacturer disclaims any warranty other than as specifically set forth herein, and may discontinue models or alter their specifications without any obligation to incorporate any modifications in equipment previously sold.

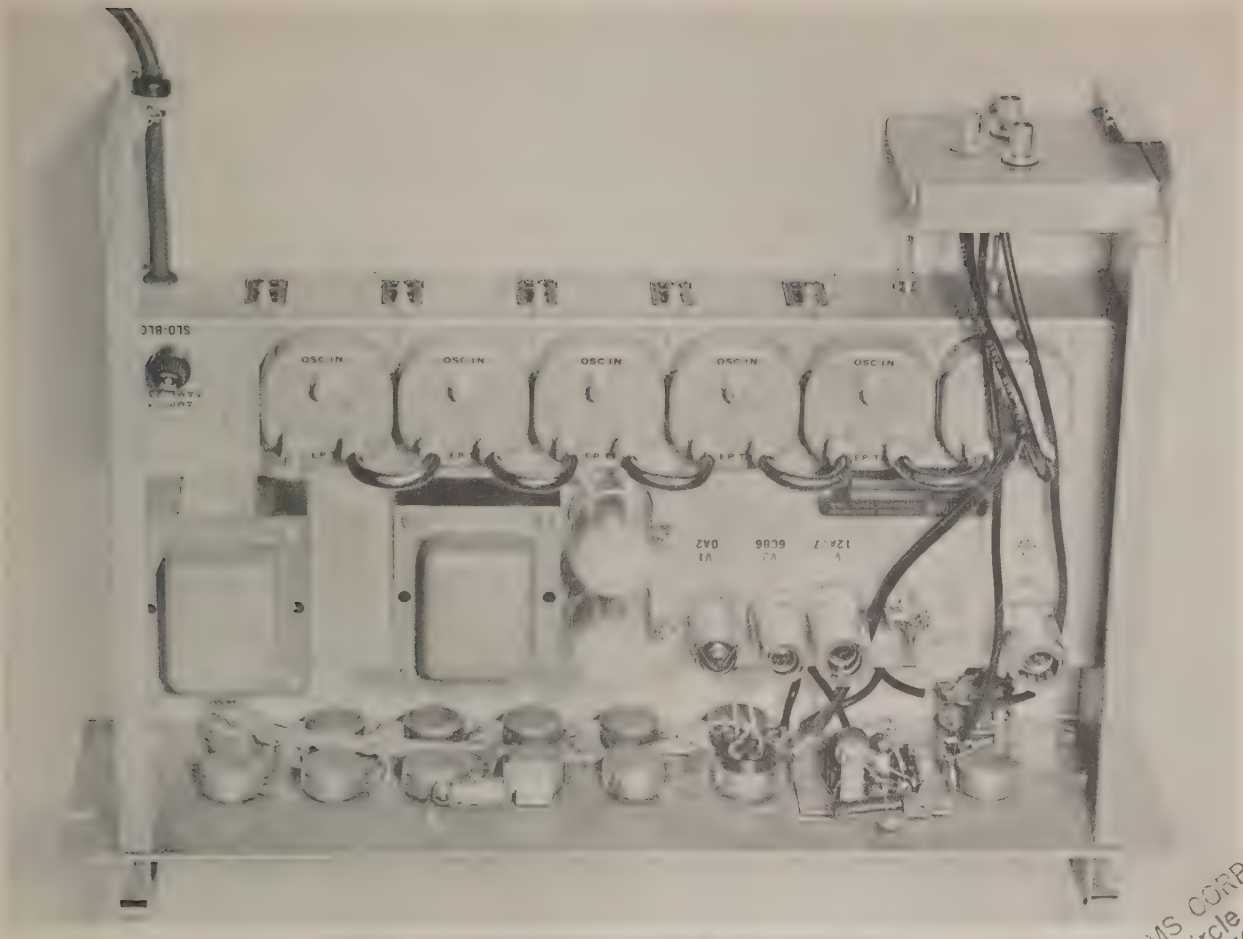


Figure 6—Jerrold Crystal-Controlled Marker Generator—Model CM-10
Top view of chassis without oscillator plug-in units.

NOTES

BAYTRON SYSTEMS CORP.
1720 Newport Circle
Santa Ana, Calif. 92705

JERROLD MARKER GENERATOR MODEL CM-6
REPLACEMENT PARTS LIST

Item	JERROLD Part #	QTY	Schematic Designation	Mfr's Name	Mfr's #	Description
						RESISTORS R-36 not assigned
31	112-112	1	R-1	Allen-Bradley	"HB" series	10 Ω, 2 W, ± 10%
32	113-008	1	R-2	True-Ohm	"FRL" series	1750 Ω, 10 W, wire wound
33	112-448	1	R-3	Allen-Bradley	"HB" series	4700 Ω, 2 W, ± 10%
34	118-062	6	R-4 thru 9	Allen-Bradley	"J" series	Pot. 100 K, 2 W, ⅜" shaft & bush
35	112-119	1	R-10	Allen-Bradley	"EB" series	10 Ω, ½ W, ± 10%
36	112-173	3	R-11, 12, 13	Allen-Bradley	"EB" series	33 Ω, ½ W, ± 10%
37	112-698	4	R-14, 18, 22, 26	Allen-Bradley	"EB" series	0.47 M, ½ W, ± 10%
38	112-488	4	R-15, 19, 23, 27	Allen-Bradley	"EB" series	10 K, ½ W, ± 10%
39	112-446	4	R-16, 20, 24, 28	Allen-Bradley	"EB" series	4700 Ω, ½ W, ± 10%
40	112-362	7	R-17, 21, 25, 29, 31, 33, 34	Allen-Bradley	"EB" series	1 K, ½ W, ± 10%
41	112-614	3	R-30, 43, 47	Allen-Bradley	"EB" series	100 K, ½ W, ± 10%
42	118-064	1	R-32	Allen-Bradley	"JS" series	Pot. 100 K, 2 W, with switch, "A" taper, ⅜" shaft & bush
43	112-530	1	R-34	Allen-Bradley	"EB" series	22 K, ½ W, ± 10%
44	112-527	1	R-35	Allen-Bradley	"EB" series	22 K, ½ W, ± 5%
45	118-063	1	R-37	Allen-Bradley	"J" series	Pot. 100 K, 2 W, "A" taper, ⅜" shaft & bush
46	112-542	1	R-38	Allen-Bradley	"EB" series	27 K, ½ W, ± 10%
47	112-656	1	R-39	Allen-Bradley	"EB" series	220 K, ½ W, ± 10%
48	112-803	1	R-40	Allen-Bradley	"EB" series	3.3 M, ½ W, ± 10%
49	112-332	1	R-41	Allen-Bradley	"EB" series	560 Ω, ½ W, ± 10%
50	112-503	1	R-42	Allen-Bradley	"EB" series	13 K, ½ W, ± 5%
51	112-599	1	R-45	Allen-Bradley	"EB" series	75 K, ½ W, ± 5%
52	112-563	1	R-46	Allen-Bradley	"EB" series	39 K, ½ W, ± 10%
						SWITCHES
53	Part of 118-064	1	SW-1	Allen-Bradley	"JS" series	Part of Pot. R-32
54	162-008	2	SW-2, 4	Carling	316-63	Toggle Switch, DPDT
55	161-117	1	SW-3	Jerrold	161-117	Wafer Switch
						TERMINATING RESISTOR
56	B822-047	1	TR-72F	Jerrold	TR-72F	75 Ω
						TRANSFORMERS
57	141-104	1	T-1	Jerrold	141-104	Power Transformer
58	823-013	1	T-2	Jerrold	823-013	Special Assembly
						TUBES
59	132-100	1	V-1	RCA	OA2	Voltage Stabilizer
60	131-400	1	V-2	RCA	12AT7	Twin Triode
61	131-402	1	V-3	RCA	12AY7	Twin Triode
						ACCESSORIES
62	B821-149	1	—	Jerrold	TO-20G	Tap-off unit
63	180-105	1	—	Royal	210	Adapter plug

JERROLD MARKER GENERATOR MODEL CM-6
REPLACEMENT PARTS LIST

Item	JERROLD Part #	QTY	Schematic Designation	Mfr's Name	Mfr's #	Description
						CAPACITORS C-1, 2, 31 not assigned
1	121-014	4	C-3, 8, 13, 18	Centralab	TCZ-20	20 pF, 600 V, ± 2%, temp. comp.
2	122-006	4	C-4, 9, 14, 19	Quality Comp.	QC-series	1.5 pF, ± 10%, gimmick
3	122-010	4	C-5, 10, 15, 20	Quality Comp.	QC-series	3.3 pF, ± 10%, gimmick
4	122-047	4	C-6, 11, 16, 21	Centralab	DD-560	56pF, 1000 V, ± 10%, cer. disc
5	124-031	4	C-7, 12, 17, 22	Erie	BPD Type	0.01 uF, 600 V, cer. disc
6	125-030	2	C-23, 27	Sprague	4TM-S15	0.015 uF, 400 V
7	125-029	1	C-24	Sprague	4Tm-D2	0.002 uF, 400 V, paper moulded
8	125-016	1	C-25	Sprague	4Tm-D1	0.001 uF, 400 V, paper moulded
9	125-006	1	C-26	Sprague	6Tm-T4	0.004 uF, 600 V, paper moulded
10	124-101	1	C-28	Erie	838-500	100 pF, 150 V, ± 20%, cer. disc
11	124-049	1	C-29	Aerovox	B-1	0.001 uF, 1000 V, ± 10%, cer. disc
12	125-031	1	C-30	Aerovox	P-123 ZB	0.047 uF, 200 V, paper moulded
13	125-032	1	C-32	Sprague	2TM-P15	0.15 uF, 200 V, paper moulded
14	127-700	1	C-33	Pyramid	TM series	20 + 10 uF, 300-350 V, electrolytic
15	125-038	1	C-34	Cornell-Dubilier	PM4P25	0.25 uF, 400 V, paper moulded
16	124-050	1	C-35	Aerovox	D-1	0.002 uF, 1000 V, ± 10%, cer. disc
17	127-506	1	C-36	Mallory	WP-068	1500 uF, 50 V, electrolytic
18	127-601	1	C-37A, B	Pyramid	TM-D-40	40 + 40 uF, 350 V, electrolytic
						CHOKE
19	823-015	1	CH-1	Jerrold	823-015	Special Assembly
						CONNECTORS
	184-013			Cinch	2770-K	Line cord and plug assembly
20	659-110	1	—	Cornish	3532	
21	188-103	4	J-1, 2, 16, 17	Amphenol	31-102	BNC chassis fitting
22	C821-155	12	J-3 thru 14	Jerrold	F-61A	Chassis fitting
23	183-212	1	J-15	Amphenol	31-207	Chassis fitting
24	184-114	3	S-1, 2, 3	Jones	S-306	6-pin socket
25	B821-196	14	—	Jerrold	F-59A	Cable connector
						CRYSTALS
26	139-113	4	CR-1, 2, 3, 4	Kemtron	K3A	Silicon diode
						FUSE
27	101-340	1	FS-1	SLO-BLO	3AG	750 mA
						PILOT LIGHT
28	102-002	1	PL-1	GE	#47	6, 3 V, 300 mA
						RECTIFIER DIODES
29	137-706	4	SiR-1, 2, 3, 4	Sarkes-Tarzian	M-150	150 mA, silicon
30	137-707	1	SiR-5	Sarkes-Tarzian	M-500	500 mA, silicon

ELECTRONIC SYSTEMS, INC.
1720 Newport Circle
Santa Ana, Calif. 92705

JERROLD MARKER GENERATOR MODEL CM-10
REPLACEMENT PARTS LIST

Item	JERROLD Part #	QTY	Schematic Designation	Mfr's Name	Mfr's #	Description
						CAPACITORS
1	121-014	6	C-1, 6, 11, 16, 21, 26	Centralab	TCZ-20	20 pF, 600 V, ± 2%
2	122-006	6	C-2, 7, 12, 18, 23, 28	Quality Comp.	QC series	1.5 pF, gimmick, ± 10%
3	122-010	6	C-3, 8, 13, 17, 22, 27	Quality Comp.	QC series	3.3 pF, gimmick, ± 10%
4	124-047	6	C-4, 9, 14, 19, 24, 29	Centralab	DD-560	56 pF, 1000 V, ± 10%
5	124-031	6	C-5, 10, 15, 20, 25, 30	Erie	BPD type	0.01 uF, 600 V, ± 10%
6	124-049	1	C-31	Aerovox	D-1 series	1000 pF, 1000 V, ± 10%
7	125-001	1	C-32	Aerovox	88W	0.047 uF, 400 V, ± 20%
8	125-032	1	C-34	Sprague	2TM-P15	0.15 uF, 200 V, ± 10%
9	127-700	1	C-35	Pyramid	TM series	20 + 10 uF, 250-300 V, electrolytic
10	125-038	1	C-36	Cornell-Dubilier	PM-4P25	0.25 uF, 400 V, ± 10%
11	124-050	2	C-37, 38	Aerovox	D-1 series	2000 pF, 1000 V, ± 10%
12	126-008	1	C-39	Arco	CM-15E-151J	150 pF, 500 V, ± 5%
13	126-016	1	C-40	Arco	CM-19B-751J	750 pF, 500 V, ± 5%
14	126-045	1	C-41	Arco	CM-19B-821J	820 pF, 500 V, ± 5%
15	125-029	1	C-42	Sprague	6TM-D2	2000 pF, 400 V, ± 10%
16	125-006	1	C-43	Sprague	6TM-T4	4000 pF, 600 V
17		1	C-44			special, varies with unit
18	125-031	1	C-45	Aerovox	P123ZB	0.047 uF, 200 V, ± 20%
19	124-034	5	C-46, 50, 51, 52, 53	Erie	817 BPF	0.02 uF, 600 V
20	125-018	1	C-47	Sprague	4TM-S3	0.03 uF, 400 V
21	127-605	1	C-48A, B	Pyramid	TM-D-40	40 + 40 uF, 350 V, electrolytic
22	127-506	1	C-49	Mallory	WP-068	1500 uF, 50 V, electrolytic
						CHOKES
23	143-115	2	CH-1, 2	Thorardson	WC-30	variable (tuned to 75 mH)
24	143-102	1	CH-3	Jerrold	143-102	broad band ampl.
						CONNECTORS
	659-116			Cornish	3532	Line cord and plug assembly
25	184-013	1	—	Cinch	2770 K	
26	188-103	4	J-1, 2, 22, 23	Amphenol	31-102	BNC chassis fitting
27	C821-155	18	J-3, 5 thru 21	Jerrold	F-61A	Chassis fitting
28	183-212	1	J-4	Amphenol	31-207	Chassis fitting
29	184-114	5	S-1, 2, 3, 4, 5	Jones	S-306	6-pin socket
30	B821-196	22	—	Jerrold	F-59A	Cable Connector

JERROLD MARKER GENERATOR MODEL CM-10
REPLACEMENT PARTS LIST

Item	JERROLD Part #	QTY	Schematic Designation	Mfr's Name	Mfr's #	Description
						CRYSTALS
31	139-113	6	CR-1 thru 6	Kemtron	K3A	Silicon Diode
32	139-117	2	CR-7, 8	Kemtron	1N54	Ge Diode
						FUSE
33	101-344	1	FS-1	SLO-BLO	3 AG	1 A/115 V
						PILOT LIGHT
34	102-001	1	PL-1	GE	#51	6.3 V, 0.3 A
						RECTIFIER DIODES
35	137-706	4	SiR-1, 2, 3, 4	Sarkes Tarzian	M-150	150 mA, silicon
36	137-707	1	SiR-5	Sarkes Tarzian	M-500	500 mA, silicon
						RESISTORS
37	118-062	10	R-1 thru R-10	Allen-Bradley	"J" series	Pot. 100 K, 2 W, linear, ⅜" shaft & bush
38	112-173	3	R-11, 12, 13	Allen-Bradley	"EB" series	33 Ω, ½ W, ± 10%
39	112-698	6	R-14, 18, 22, 26, 30, 34	Allen-Bradley	"EB" series	470 K, ½ W, ± 10%
40	112-446	6	R-15, 19, 23, 27, 31, 35	Allen-Bradley	"EB" series	4700 Ω, ½ W, ± 10%
41	112-488	7	R-16, 20, 24, 28, 32, 36, 54	Allen-Bradley	"EB" series	10 K, ½ W, ± 10%
42	112-362	9	R-17, 21, 25, 29, 33, 37, 45, 61, 62	Allen-Bradley	"EB" series	1 K, ½ W, ± 10%
43	112-542	1	R-38	Allen-Bradley	"EB" series	27 K, ½ W, ± 10%
44	112-656	1	R-39	Allen-Bradley	"EB" series	220 K, ½ W, ± 10%
45	112-803	1	R-40	Allen-Bradley	"EB" series	3.3 M, ½ W, ± 10%
46	112-332	2	R-41, 56	Allen-Bradley	"EB" series	560 Ω, ½ W, ± 10%
47	112-503	1	R-42	Allen-Bradley	"EB" series	13 K, ½ W, ± 5%
48	112-614	4	R-43, 46, 50, 57	Allen-Bradley	"EB" series	100 K, ½ W, ± 10%
49	112-599	1	R-44	Allen-Bradley	"EB" series	75 K, ½ W, ± 5%
50	112-536	1	R-47	Allen-Bradley	"EB" series	39 K, ½ W, ± 10%
51	118-063	1	R-48	Allen-Bradley	"J" series	Pot. 100 K, 2 W, with switch
52	112-551	1	R-49	Allen-Bradley	"EB" series	33 K, ½ W, ± 10%
53	118-016	1	R-51	Allen-Bradley		Pot. 50 K, 2 W, ⅜" shaft, ¼" thd.
54	118-064	1	R-52	Allen-Bradley	"JS" series	Pot. 100 K, 2 W, "A" taper, ½" shaft, ⅜" bush, with switch
55	112-572	1	R-53	Allen-Bradley	"EB" series	47 K, ½ W, ± 10%
56	112-593	1	R-55	Allen-Bradley	"EB" series	68 K, ½ W, ± 10%
57	112-278	1	R-58	Allen-Bradley	"EB" series	220 Ω, ½ W, ± 10%
58	113-011	1	R-59	True-Ohm	"ERL" series	10 K, 10 W, wire wound
59	112-112	1	R-60	Allen-Bradley	"HB" series	10 Ω, 2 W, ± 10%

LAYTRON SYSTEMS CORP
1720 Newport Circle
Santa Ana, Calif. 92705

JERROLD MARKER GENERATOR MODEL CM-10
REPLACEMENT PARTS LIST

Item	JERROLD Part #	QTY	Schematic Designation	Mfr's Name	Mfr's #	Description
						SWITCHES
60	161-117	1	SW-1	Jerrold	161-117	Wafer Switch
61	161-007	1	SW-2	Carling	112-63	Toggle Switch, SPDT
62	161-008	1	SW-3	Carling	316-63	Toggle Switch, DPDT
63	Part of 118-064	1	SW-4			Part of Pot. R-48
						TERMINATING RESISTOR
64	B822-047	1	TR-72F	Jerrold	TR-72F	75 Ω
						TRANSFORMERS
65	141-154	1	T-1	Jerrold	141-154	Power Transformer
66	823-021	1	T-2	Jerrold	823-021	Special Assembly
						TUBES
67	132-100	1	V-1	RCA	OA2	Voltage Stabilizer
68	131-313	1	V-2	RCA	6CB6	Pentode
69	131-402	2	V-3, V-4	RCA	12AY7	Twin-Triode
						ACCESSORIES
70	B821-149	1	TO-20	Jerrold	TO-20	Tap-off unit
71	180-105	1	—	Royal	210	Adapter plug

JERROLD OSCILLATOR PLUG-IN UNITS FOR MARKER GENERATOR MODEL CM-6 AND CM-10, REPLACEMENT PARTS LIST

Item	JERROLD Part #	QTY	Schematic Designation	Mfr's Name	Mfr's #	Description
			1. Hi & Hi FREQ. OSCILLATOR			
						CAPACITORS
1	123-115	5	C-1, 2, 3, 4, 5	Erie	GP2-332	1000 pF, 600 V
2		1	C-6			special, according to frequency scale
3		1	C-7			special, according to frequency scale
4	128-505	2	C-8, 9	Erie	535	0.7-3 pF, 350 V, trimmer
						CRYSTALS
5	139-109	2	CR-1, 2	McCoy	special	special, according to frequency requirement
						RESISTORS
6	112-488	2	R-1, 3	Allen-Bradley	"EB" series	10 K, ½ W, ± 10%
7	112-614	2	R-2, 4	Allen-Bradley	"EB" series	100 K, ½ W, ± 10%
						TERMINATING RESISTOR
8	B822-047	1	TR-72F	Jerrold	TR-72F	75 Ω
						TUBE
9	131-400	1	V-1A, B	RCA	12AT7	Twin-Triode
			2. Hi & Lo FREQ. OSCILLATOR			
						CAPACITORS
1	123-115	2	C-1, 3	Erie	GP2-332	1000 pF, 600 V, ceramic disc
2		1	C-2			special, according to frequency scale
3	128-505	1	C-4	Erie	535	0.7-3 pF, 350 V, trimmer
4	124-031	3	C-5, 7, 9	Erie	BPD Type	0.01 pF, 600 V, ceramic disc
5	128-500	1	C-6	Erie	557-NPO	1.5-7 pF, 350 V, trimmer
6	126-013	1	C-8	Arco	CM-15	100 pF, 500 V, ± 5%, mica
						CRYSTALS
7	139 109	2	CR-1, 2	McCoy	special	special, according to frequency requirement
						RESISTORS
8	112-488	2	R-1, 3	Allen-Bradley	"EB" series	10 K, ½ W, ± 10%
9	112-614	2	R2, 4	Allen-Bradley	"EB" series	100 K, ½ W, ± 10%
						TERMINATING RESISTOR
10	B822-047	1	TR-72F	Jerrold	TR-72F	75 Ω
						TUBE
11	131-400	1	V-1A, B	RCA	12AT7	Twin-Triode

JERROLD OSCILLATOR PLUG-IN UNITS FOR MARKER GENERATOR MODEL CM-6 AND CM-10, REPLACEMENT PARTS LIST

Item	JERROLD Part #	QTY	Schematic Designation	Mfr's Name	Mfr's #	Description
			3. Lo & Lo FREQ. OSCILLATOR			
						CAPACITORS
1	126-013	2	C-1, 9	Arco	CM-15	100 pF, 500 V, ± 5%, mica
2	124-031	5	C-2, 3, 5, 6, 8	Erie	BPD Type	0.01 uF, 600 V, ceramic disc
3	128-500	2	C-4, 7	Erie	557-NPO	1.5-7 pF, 350 V, trimmer
						CRYSTALS
4	139-109	2	CR-1, 2	McCoy	special	special, according to frequency requirement
						RESISTORS
5	112-614	2	R-1, 4	Allen-Bradley	"EB" series	100 K, ½ W, ± 10%
6	112-488	2	R-2, 3	Allen-Bradley	"EB" series	10 K, ½ W, ± 10%
						TERMINATING RESISTOR
7	B822-047	1	TR-72F	Jerrold	TR-72F	75 Ω
						TUBE
8	131-400	1	V-1A, B	RCA	12AT7	Twin-Triode

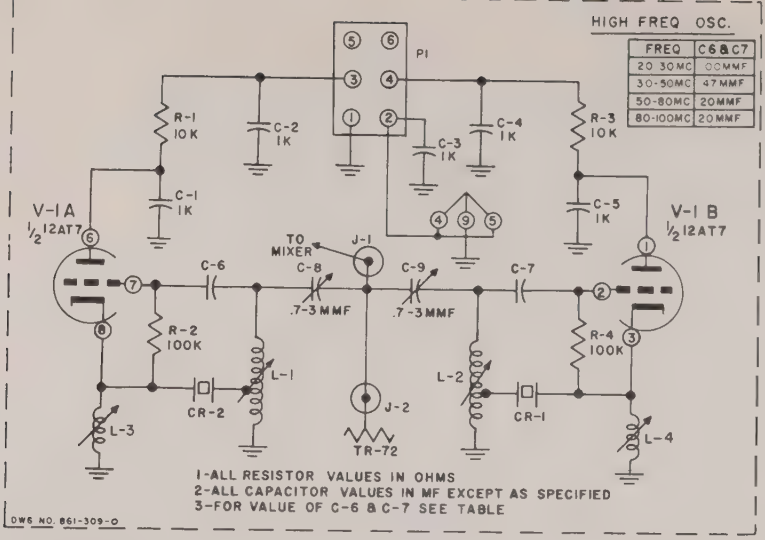


Figure 13

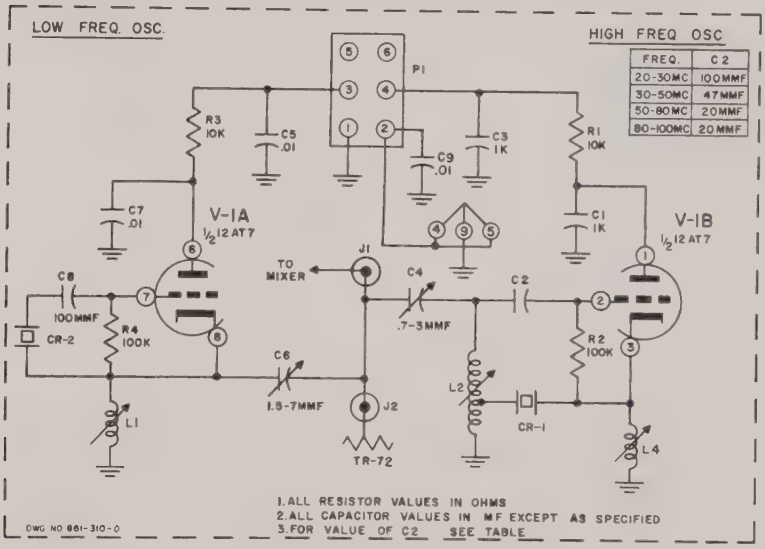


Figure 14

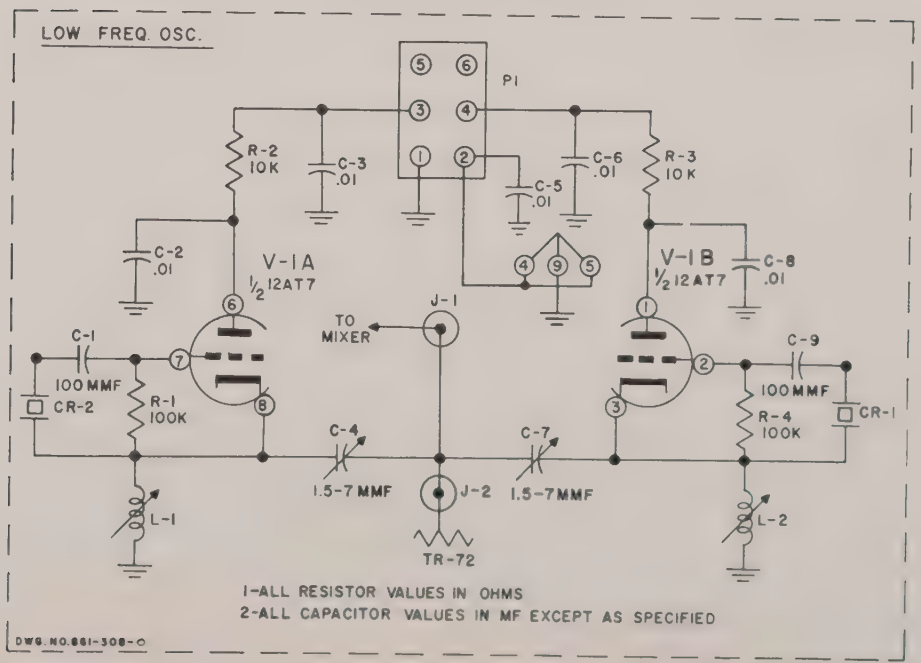
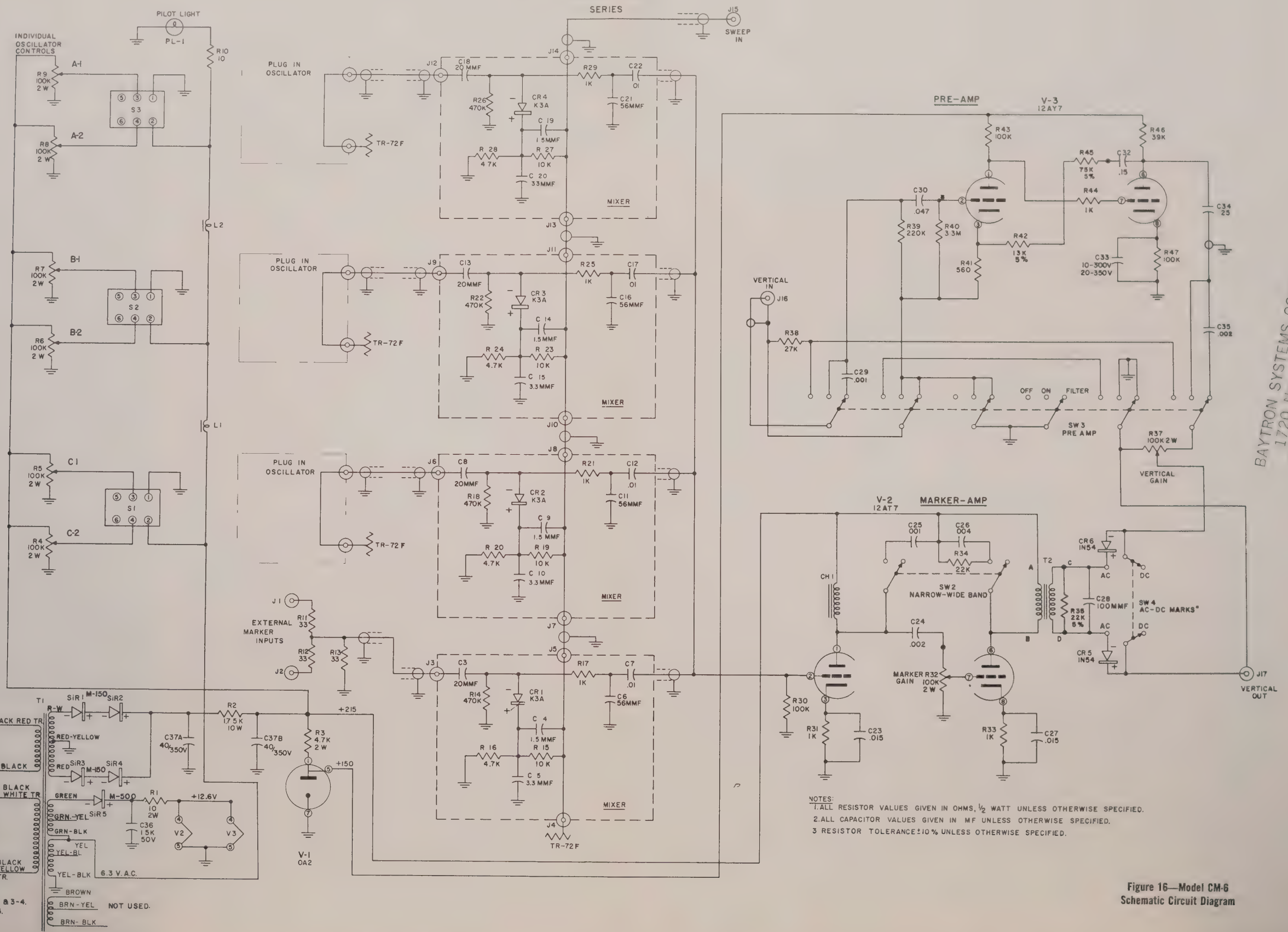


Figure 15

SCHEMATIC
MARKER GENERATOR
MODEL CM-6

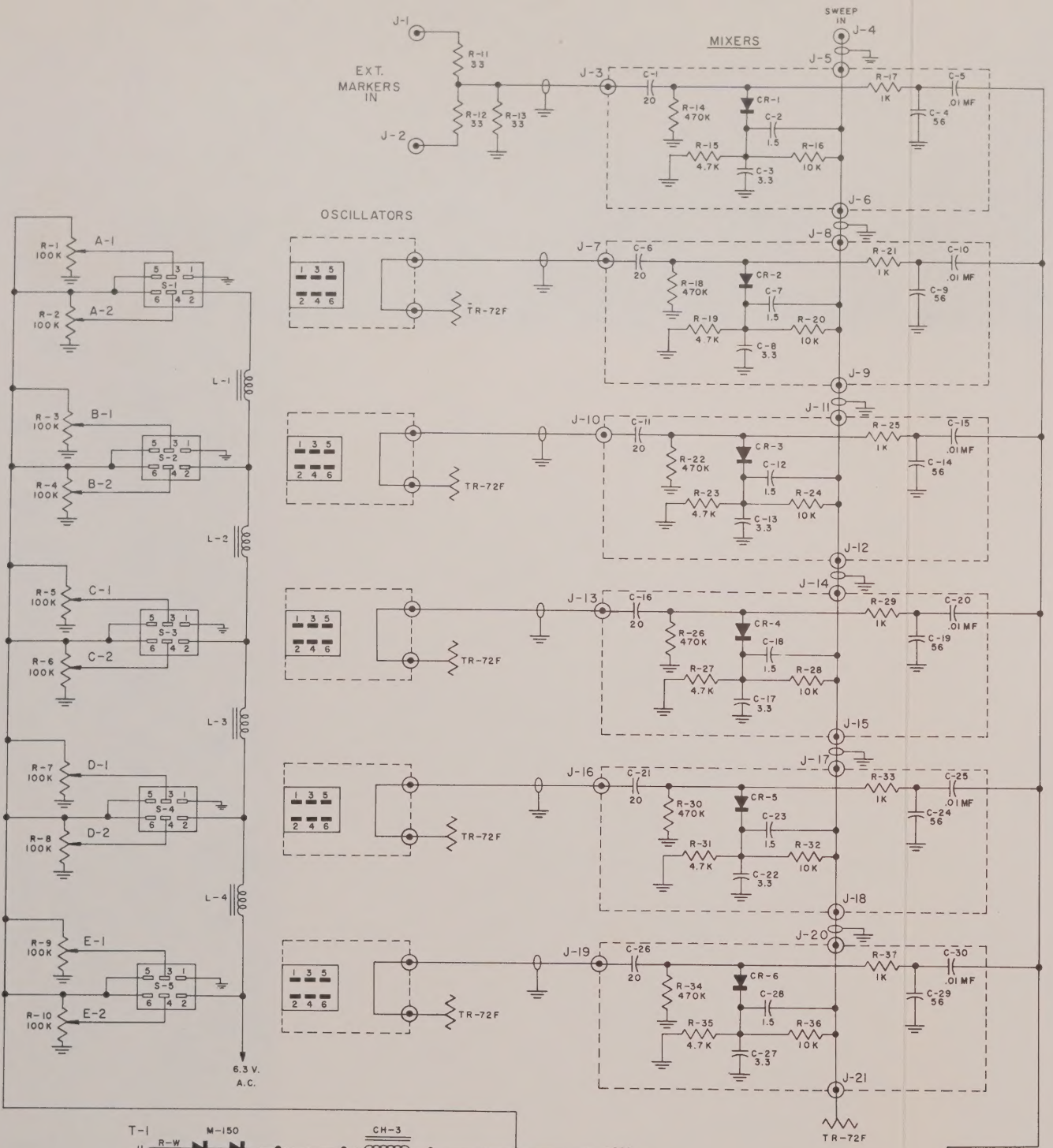


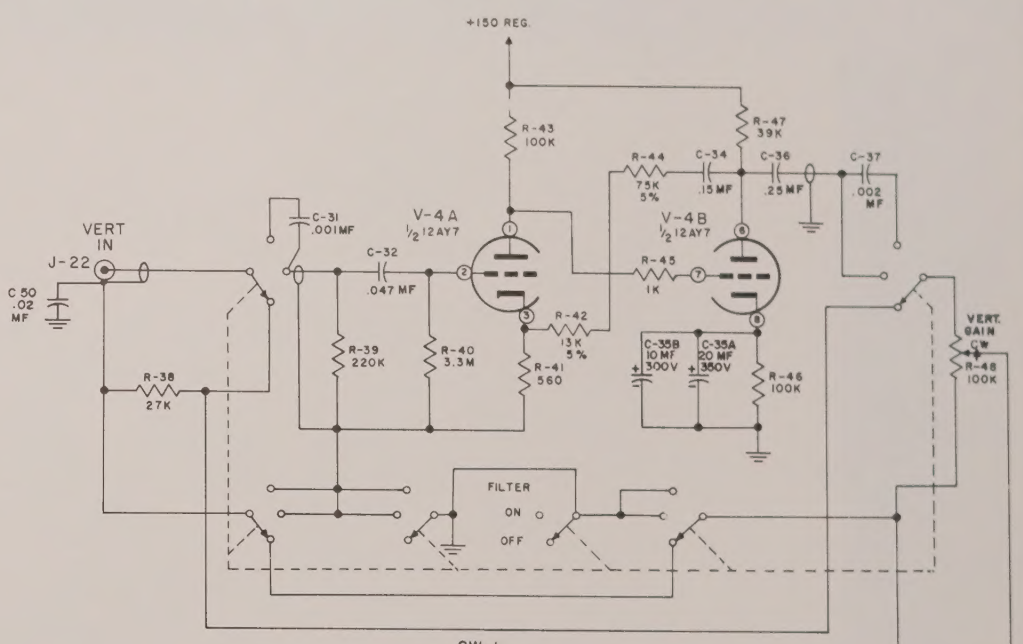
NOTES:
1. ALL RESISTOR VALUES GIVEN IN OHMS, ½ WATT UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES GIVEN IN MF UNLESS OTHERWISE SPECIFIED.
3 RESISTOR TOLERANCE ±10 % UNLESS OTHERWISE SPECIFIED.

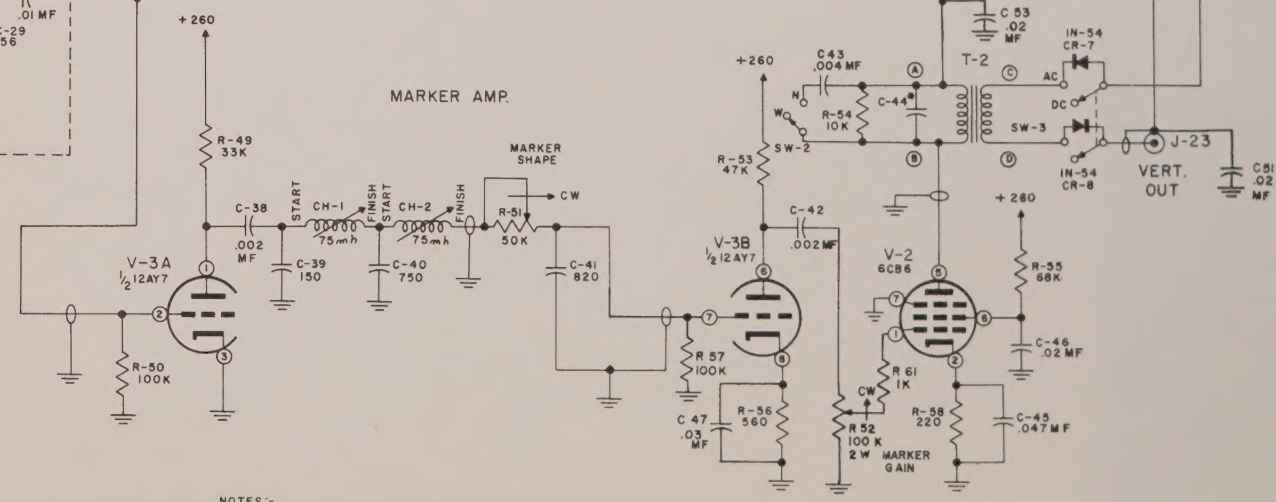
Figure 16—Model CM-6 Schematic Circuit Diagram

BAYTRON SYSTEMS CORP.
1720 Newport Circle
Santa Ana, Calif. 92705

SCHEMATIC
MARKER GENERATOR
MODEL CM-10
SERIES-

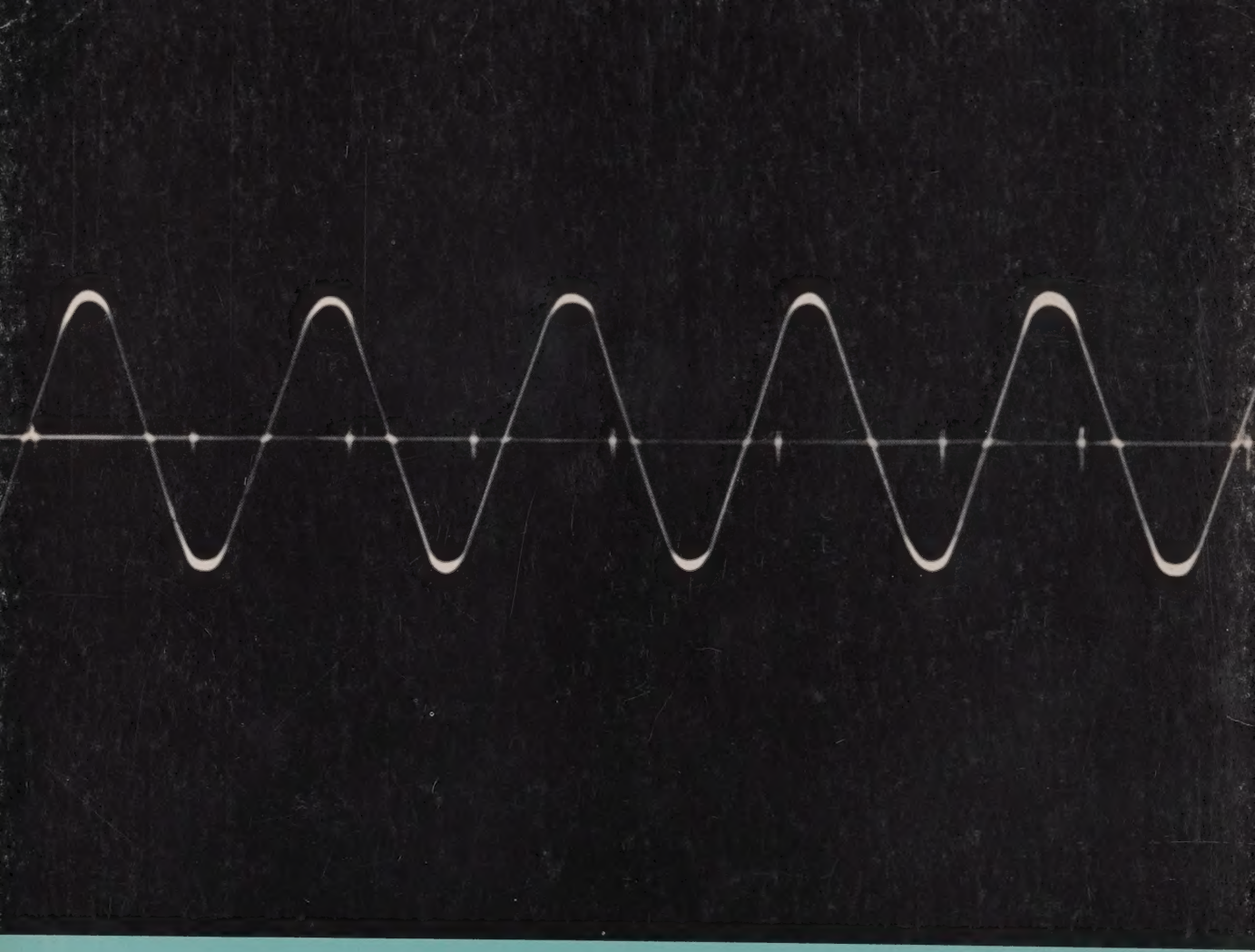






NOTES:-
1- * TO BE SELECTED IN PRODUCTION TEST.
2- ALL RESISTOR VALUES GIVEN IN OHMS.
3- ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.
4- ALL CAPACITOR VALUES GIVEN IN MMF UNLESS OTHERWISE SPECIFIED.

Figure 17—Model CM-10 Schematic Circuit Diagram



93354